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Patent claims

1. A method for producing a connection area (4) on a work piece (1), in particular on a vehicle body plate, which connection area (4) is positioned precisely with respect to a reference area (8) on the work piece (1),

- in which method, a robot-guided processing tool (9, 109) is used for shaping the connection area (4), which processing tool (9, 109) forms a tool/sensor combination (16, 116) with a sensor system (13, 113) which comprises at least one sensor (14, 14', 14", 114) and is permanently connected to the tool (9, 109),
- wherein the tool/sensor combination (16, 116) is firstly moved, within the scope of a positioning phase (II) from a proximity position (24), which is independent of the position of the work piece (1) in the working space (23) of the robot (11), into a preliminary position (18) in which the tool/sensor combination (16, 116) is oriented in a precisely positioned fashion with respect to the reference area (8) of the tool (1), and
- wherein the tool/sensor combination (16, 116) is then guided, in a processing phase (III), from this preliminary position (18) along a processing path under the control of a robot, in the course of which processing path the connection area (4) is formed on the work piece (1),

characterized in that, in order to move into the preliminary position (18), an iterative closed-loop control process is run through, in the course of which

- an (actual) measured value of the at least one sensor (14, 14', 14", 114) is generated,
- this (actual) measured value is compared with a (setpoint) measured value generated within the scope of a setup phase,
- a movement vector of the tool/sensor combination (16, 116) is calculated from the difference between the (actual) measured value and (setpoint) measured value using a Jacobi matrix calculated within the scope of the setup phase,
- the tool/sensor combination (16, 116) is displaced by this movement vector.

2. The method as claimed in claim 1, characterized in that the iterative closed-loop control process is aborted if

- either the deviation between the (setpoint) measured value and (actual) measured value lies below a predefined threshold value, or
- the reduction which is to be brought about in this deviation during successive iteration steps lies below a predefined threshold value.

3. The method as claimed in claim 1 or 2, characterized in that the positioning phase (II) and the processing phase (III) take place in an overlapping fashion with respect to one another.

4. The method as claimed in one of the preceding claims, characterized in that a TCP/IP interface is used for the purpose of communication between the open-loop control device (12) of the robot (11) and the evaluation unit (20) of the sensor system (13).

5. The method as claimed in one of the preceding claims, characterized in that the measured values of different individual sensors (14, 14", 114) of the sensor system (13, 113) are used for position control for positioning the tool/sensor combination (16, 116) with respect to different vehicle body types or with respect to different reference areas (8) of the same vehicle body type.

6. The use of the method as claimed in one of claims 1 to 5, characterized in that the method is used for producing connection areas (4) in a tail light area (3) of a vehicle body (1).

7. The use of the method as claimed in one of claims 1 to 5, characterized in that the method is used for the precisely positioned welding of adjustment elements (28) for orienting a cockpit (33) to a front end wall (27) of a vehicle body (1).

8. A device for producing a connection area (4) on a work piece (1), in particular a vehicle body part,

- having a processing tool (9, 109) which is guided using a robot (11, 111),
- having a sensor system (13, 113) which is permanently connected to the processing tool (9, 109) and comprises at least one sensor (14, 14', 14", 114),
- having a control device for controlling the robot (11) and the processing tool (9, 109),

- and having an evaluation unit (20) for evaluating the measured values of the sensor system (13, 113),

characterized in that at least one of the sensors (14, 14', 14", 114) is a metrically noncalibrated sensor.

9. The device as claimed in claim 8, characterized in that a stamping/punching tool is used as the processing tool (9).

10. The device as claimed in claim 8, characterized in that a bolt welding device is used as the process tool (109).

11. The device as claimed in claim 8 or 9, characterized in that the at least one sensor (14, 14', 14") is a triangulation sensor which measures at points.

12. The device as claimed in one of claims 8 to 11, characterized in that the at least one sensor (14, 14', 14", 114) is an optical sensor which measures over an area.